# The Social Impact of Dental Problems and Visits

## ABSTRACT

Objectives. The purpose of this analysis was to assess selected social consequences of maintaining oral health and treating oral diseases. The associations among socioeconomic and demographic factors with time lost from work or school and reductions in normal activities are explored.

Methods. Data were gathered as part of the 1989 National Health Interview Survey from 50 000 US households (117 000 individuals), representing 240 million persons. The oral health care supplement was analyzed using the software SUDAAN to produce standard errors for estimates based on complex multistage sample designs.

Results. Because of dental visits or problems, 148 000 hours of work were lost per 100 000 workers, 117 000 hours of school were lost per 100 000 school-age children, and 17 000 activity days beyond work and school time were restricted per 100 000 individuals in 1989. Exploratory analyses suggest that sociodemographic groups have different patterns of such time loss and of reduced normal activities.

Conclusions. Overall, there is low social impact individually from dental visits and oral conditions. At the societal level, however, such problems and treatments among disadvantaged groups appear to have a greater impact. (Am J Public Health. 1992;82:1663–1668)

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#### Introduction

Concepts and measures of social impact have been developed, tested, and discussed in previously published research.<sup>1–5</sup> The impact of oral health problems on society has been defined as the outcomes related to limitations in role performance and functional capabilities. This definition draws on an extensive literature, which defines health as an optimal level of social, psychological, and physical functioning.<sup>2,6</sup>

Although indirect costs that are associated with oral health care, such as lost wages or time missed from school, are not well documented, existing data<sup>2,6,7</sup> suggest that total time lost from work due to oral health care is associated with previous time loss, low income, being non-White, having poorer oral health, and having greater treatment need. Sick leave and insurance benefits appear not to be associated with time loss. People who report having a regular dentist appear to lose fewer hours of work. The primary reason for dentally related time loss seems to be difficulties in obtaining care during nonwork or nonschool hours.

Work time or school days lost are useful population statistics for measuring the social impact of oral health because (1) there is a high prevalence of oral diseases8; (2) between one-half and two-thirds of the population visit a dental office during a year, either for routine maintenance or for treatment of oral conditions or diseases; (3) any dental visit entails a minimum of one-half hour of direct appointment time plus associated travel time; (4) the dental care delivery system is available predominantly during work or school hours; (5) time lost from work can be compared across conditions to determine whether there are similar cultural and treatment factors; (6) this indicator represents a multidimensional approach to the measurement of health; and (7) the data are easily obtainable in a large population survey. Thus, the nature of the delivery system and the ubiquitousness of oral diseases make a study of the social impact of oral conditions and dental visits relevant.

The purposes of this paper are (1) to provide the descriptive results from exploratory analyses of a data set that, for the first time at the national level, is specific to selected social consequences of maintaining oral health and treating oral problems; and (2) to explore possible associations of socioeconomic factors with work time and school days lost and with reductions in usual activities.

#### Methods

Source of Data

These analyses are based on the 1989 National Health Interview Survey (NHIS). The NHIS has two parts for the household: a basic health and demographic questionnaire (core), which is the same every year, and several specific health topic questionnaires.

The 1989 NHIS included an oral health care supplement for all persons aged 2 years and over (n = 109603). It provided information on a range of pre-

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	Total Hours, in Thousands	Hours Missed			Hours Missed by Those with Missed Hours		
		Mean	One SE	Unweighted Sample	Mean	One SE	Unweighted Sample
Total US employed population	164 179.7	1.48	(.118)	51 519	114.1	(7.23)	668
Sex							
Male	76 107.6	1.24	(.134)	27 728	96.9	(7.88)	351
Female	88 072.9	1.77	(.204)	23 791	134.7	(13.96)	317
Age, <sup>a</sup> y							
18-24	32 376.7	1.93	(.477)	7 402	212.6	(45.13)	71
25-44	93 328.2	1.52	(.137)	28 177	105.8	(6.56)	405
45-64	37 793.0	1.28	(.204)	14 209	95.7	(13.87)	187
≥ 65	681.8	.19	(.093)	1 731	67.2	(13.05)	5
Race							
White	140 868.7	1.47	(.119)	43 664	105.8	(6.63)	610
Black	20 530.7	1.78	(.537)	6 305	231.3	(65.18)	49
Other	2 780.3	.76	(.346)	1 550	150.2	(33.07)	9
Ethnicity							
Non-Hispanic	151 332.6	1.47	(.124)	47 763	112.9	(7.57)	624
Hispanic	12 847.1	1.54	(.308)	3 756	129.6	(17.82)	44
Education, y							
≤ 12	82 690.7	1.38	(.154)	28 116	136.5	(11.62)	288
> 12	81 488.9	1.50	(.180)	23 403	97.7	(9.34)	380
Family income <sup>a</sup>							
< \$10 000	30 050.1	1.40	(.304)	10 174	153.6	(29.80)	91
\$10-19 999	19 288.1	1.25	(.255)	7 228	154.4	(20.62)	61
\$20-34 999	54 348.2	1.92	(.312)	13 043	147.5	(20.17)	174
≥ \$35 000	60 493.2	1.32	(.122)	21 074	80.6	(5.04)	342
Dental insurance coverage <sup>a</sup>							
Yes	98 650.8	1.62	(.142)	28 194	101.5	(6.89)	450
No	65 528.8	1.31	(.193)	23 325	140.1	(17.88)	218

ventive and dental visit behaviors. Also, for the first time at the national level, questions were asked about time lost from work or school and about the reduction of normal activities over the past 2 weeks as these effects related specifically to oral health problems and dental visits (see Appendix 1). These questions were worded similarly to those that have been traditionally asked on the core NHIS questionnaire about work and school time lost in a 2-week period because of acute medical conditions. Due to space limitations, no questions were asked about the seriousness of any oral condition or the specific reason for the reported time loss.

#### Statistical Analyses

The descriptive analyses have been conducted to improve the understanding of the aggregate social consequences of oral problems and dental visits specifically in terms of loss of work and school time and reduction in normal activities. School time lost is estimated for all school-age children; work time lost is estimated for individuals who reported working during the past 2 weeks; and reduction in normal activity is calculated for the entire sample, irrespective of age or employment.

The data have been adjusted for unequal probabilities of selection and for clustering introduced during sampling. Sampling weights were included to generalize the estimates to the civilian noninstitutionalized population for the entire year of 1989. The questions forming the basis of these analyses were 2-week recalls for which the NHIS has standardized weights to achieve annual estimates. The numbers in column 1 of the tables represent aggregate volume for the year. The estimates of

the volumes or means cannot be used to infer anything about individuals, nor can they be used to classify individuals by characteristics over the 12-month period. After we accounted for clustering introduced by the sample design, 10 standard errors were calculated using SUDAAN, a software package for estimates based on complex multistage sample designs. 10,11 Other programming software is not suitable because standard errors based on complex survey designs such as this are typically about 20% larger than those that would be obtained with a simple random sample.

Given the exploratory and descriptive objectives of this study, the analysis of subgroup differences was approached in two stages. In the first stage, a preliminary assessment of subgroup differences was carried out based on comparisons of certain confidence intervals for each statistic being studied. To accomplish this, confidence intervals were developed for each statistic by adding or subtracting the value of one standard error to the observed value of each statistic. Then the values of the confidence intervals associated with any pairwise comparison were evaluated to determine whether the confidence intervals overlapped. This approach allowed the identification of subgroup differences regardless of statistical significance, which probably should be taken into account in the design and analysis of future studies. In the second stage of analysis, the subgroup differences that were identified in the first stage were further evaluated using a t test with a critical value of 1.96 (P < .05). The results of this approach were confirmed by applying a multiple comparisons procedure to these data, as implemented in SUDAAN.

Because the results of each of these analytical stages have been integrated into the presentation of the findings, it should be noted that all differences highlighted in the text have passed at least the first criterion, but that only differences explicitly identified as statistically significant have passed the second criterion (P < .05).

The relatively small percentage (approximately 1%) of the sample with time lost limited the number of categories within variables that could be analyzed effectively. Means based on small numbers and/or with more than 30% relative standard errors were not discussed in the text because they are relatively unstable. In some cases, however, they were included in the tables for other data users who might be interested in combining these

with related values to produce an estimate for a more general category of interest.

#### Results

#### Work Hours Lost

Table 1 presents three outcome variables estimated to the annual level: total hours missed (in thousands), mean hours missed, and the average number of hours missed by those individuals who had missed hours. These variables are presented for the total sample who reported employment in the 2 weeks prior to the interview and by sociodemographic factors. Table 1 shows that, in 1989 at the national level, 164 million hours of work were missed annually by employed individuals as a result of their own dental visits or problems. This volume of time lost from work represents about 148 000 hours missed per 100 000 employed individuals. Females and persons with incomes from \$20 000 to \$35 000 were more likely to have missed time from work than males or persons in either the higher or lower income groups. Adults aged 17 to 24, 25 to 44, and 45 to 64 missed more hours of work for dental visits or oral problems than did those aged 65 and older (P < .05).

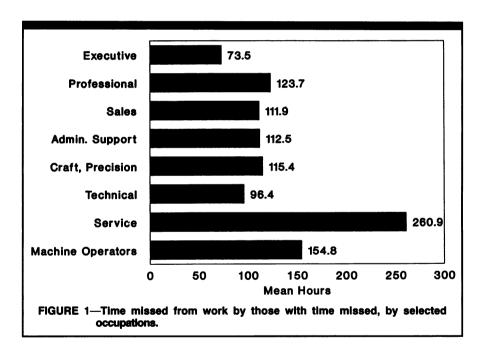
Among those who missed some work time (Table 1, column 3), it was females, Blacks, and those aged 17 to 24, without dental insurance, with less education, and with lower income (below \$35 000) who had missed the greatest number of hours. The mean number of hours missed by those in the \$35 000-and-over income group who missed time is significantly lower (P < .05) than that of those in other income groups who missed time.

Figure 1 summarizes the mean number of hours missed from work for an individual's own dental visit or problem by those who missed some time for selected occupations. Data are shown for those occupational groups with 20 or more in the subsample. With the exception of technical personnel, the comparisons follow the expectations of class effects: among those who had lost any time, those in the higher social classes (e.g., executives) appear to have lost fewer work hours, whereas service workers appear to have lost the most time.

Analyses also were conducted using a variable that reflects both time missed due to an individual tending to his or her own dental problems or visits *and* time missed due to an individual assisting someone else (Table 2). Approximately 170 000 hours per 100 000 persons are es-

TABLE 2—Hours Missed Annually from Work Because of Own Dental Visit/Problem and to Assist Relative or Friend with Dental Visit/Problem, among the US Employed Population

		Hours Missed				
	Total Hours, in Thousands	Mean	One SE	Unweighted Sample		
Total US employed population	189 119.9	1.70	.123	51 524		
Sex						
Male	87 882.2	1.43	.141	27 731		
Female	101 237.6	2.03	.207	23 793		
Age, y						
18-24	35 308.8	2.10	.484	7403		
25-44	109 294.7	1.78	.147	28 178		
45-64	43 723.6	1.47	.214	14 212		
≥ 65	792.7	.22	.099	1 731		
Race						
White	163 900.4	1.71	.127	43 668		
Black	21 848.2	1.89	.538	6 306		
Other	3371.3	.93	.339	1 550		



timated to have been missed by employed individuals during the year when time lost for both causes is counted. When this combined variable is used, there is an increase in hours missed by women compared with that reported in Table 1 (2.03 vs 1.77).

#### School Time Lost

At the national level, more than 51 million hours of school were missed annually by school-age children as a result of visits to a dentist or an oral problem (Table 3). This is 117 000 hours missed per

100 000 school-age children. Females missed significantly more school hours during the year than males (P < .05), and White children missed significantly more school hours than Black children (P < .05). Mean hours missed increased with age, with 156 000 hours per 100 000 children being missed nationally per year by teenagers (ages 13 to 17). When only children who have lost some school time are considered, females, Hispanics, those all with lower income, and those without insurance appear to have missed more hours.

	Total Hours, in Thousands	Hours Missed			Hours Missed by Those with Missed Hours		
		Mean	One SE	Unweighted Sample	Mean	One SE	Unweighted Sample
Total school-age children	51 679.1	1.17	(.128)	22 321	86.8	(6.63)	295
Sex							
Male	18 331.3	.82	(.095)	11 399	73.3	(5.59)	129
Female	33 347.8	1.55	(.231)	10 922	96.7	(10.97)	166
Age, y							
5–7	7 261.9	.68	(.156)	5 3 1 8		(15.43)	41
8–12	19 095.4	1.12	(.172)	8 704		(7.25)	114
13–17	25 321.7	1.56	(.238)	8 299	90.3	(11.11)	140
Race							
White	44 464.6	1.25	(.146)	17 475		(6.9)	260
Black	4 076.3	.59	(.141)	4 058		(11.03)	27
Other	3 138.6	1.92	(1.16)	788	213.8	(62.16)	8
Ethnicity <sup>a</sup>							
Non-Hispanic	46 131.7	1.20	(.139)	19 586		(7.08)	269
Hispanic	5 547.3	1.00	(.246)	2 735	113.1	(13.35)	26
Education of responsible adult, y							
≤ 12	19 367.6	0.86	(0.161)	11 585	98.9	(15.29)	99
> 12	32 311.5	1.50	(.194)	10 736	80.9	(6.6)	196
Family income <sup>a</sup>							
< \$10 000	8 947.0	.86	(.208)	5 442		(14.03)	43
\$10-19 999	9 716.0	1.35	(.328)	3 700		(23.04)	41
\$20-34 999	12 239.9	1.13	(.293)	5 454		(22.57)	66
≥ \$35 000	20 776.0	1.32	(.150)	7 725	67.9	(4.81)	145
Dental insurance coverage							
Yes	27 582.0	1.24	(.188)	11 051	74.5	(8.25)	179
No	24 097.1	1.10	(.149)	11 270	107.2	(10.15)	116

#### Restricted Activity Days

More than 41 million restricted activity days, beyond time lost from school or work, were estimated for all ages at the national level for 1989 (Table 4). This time was estimated as 17 000 days per 100 000 individuals. Females had approximately twice the number of restricted activity days as males (23 000 vs 11 000 per 100 000) (P < .05). Restricted activity days were also more common among adults than among children. The more disadvantaged socioeconomic groups (those in households with incomes below \$20 000, those without dental insurance, and those with less than 12 years education) had a significantly greater number of restricted activity days than those with higher incomes, those with more education, and those with dental insurance.

#### Dental Visits and Time Lost

One question that comes to mind is the relative contribution of dental visits versus dental problems to time missed. The data suggest that dental visits are not the sole cause of time missed: between 3% and 4% of those with no dental visits in the past 2 weeks still cut down some on normal activities or missed some time from work or school in the same period. Dental treatments that required multiple dental visits may impose more restrictions on normal activities, including work and school. For example, 14% of those with one dental visit, 25% of those with two dental visits, and 22% of those with three or more dental visits during the 2 weeks had lost some time from work or school.

#### Discussion

Describing how oral problems and treatments limit functioning in work and school has allowed for one aspect of their impact on society to be evaluated. Overall, a mean of 1.48 hours of work lost per employee per year is of little consequence. At the societal level, however, 164 180 hours of work lost annually from the work force may be a significant problem in terms of staffing, sick leave, and other workplace policy issues.

Identifying groups that are more likely to be responsible for such losses is important. Such subgroups need to be investigated in greater depth. For example, it is paradoxical that, although losing some work or school hours and days of usual activity are associated with demographic variables (sex, age), these measures have little relation to socioeconomic variables. In contrast, the more socioeconomically disadvantaged (no insurance, lower incomes, less education) lost more total hours when only those with time lost were considered. Thus, the lower socioeconomic individual bears the combined burden of an increased number of lost work and school hours and of restricted activity days.

Financial barriers, perceived needs, and attitudes about oral health promotion each influence the nature and extent of the impact that such losses and restrictions have on society. If the evidence from these exploratory analyses is viewed within the context of what is known about the dental delivery system, the potential implications of differences among social groups may become more evident. For those who visit the dentist routinely and preventively, the time per visit could be 30 minutes to 1 hour of direct commitment plus travel time. Social groups with this pattern of use can more easily accommodate dental visits efficiently before or after work or school or during lunch. In contrast, those without a routine and preventive orientation to dental care are more likely to incur oral problems that may result in reduced activity and/or dental treatments that involve lengthy and/or multiple appointments.

Without more in-depth information, it is difficult to attribute underlying causes for the observed differences in time lost from work. There may be several possible explanations. Occupational groups often exhibit different patterns of official leave and work ethics. Those individuals who are more likely to have a preventive orientation that reduces the time burden for

a dental visit are also more likely to be professionals, who may have more autonomy within the context of their jobs to take time off from work (e.g., an extended lunch hour). On the other hand, individuals who delay visits until treatment needs are acute and oral health has deteriorated are more likely to be in other occupational groups, in which they are also likely to have less autonomy in their jobs. These same people may have limited transportation options and thus expend more time in getting to and from a dental office. Further, they may have more constraints on their time outside of work because of second jobs, limits on child care, or singleparent status. Adults in lower socioeconomic classes are likely to have a shortterm orientation to planning, compared with individuals in middle and upper socioeconomic groups. Finally, evidence suggests that perceptions of need for care and the use of home remedies also vary by socioeconomic class. Lower socioeconomic individuals often use home remedies and self-care to avoid professional care, while upper socioeconomic individuals engage in self-care to complement professional care. Further investigation is needed to examine these hypotheses.

Reported school hours missed for dental visits or dental problems increased with age and were more common among females and Whites. Without the treatment records, it is impossible to determine the exact reasons for these findings, but one might speculate that those children who have ready transportation from parents during the day and for whom loss of school time is not seen as a problem may lose time from school. Similarly, those in orthodontic care or other treatment programs requiring multiple visits are also more likely to take some time from school. However, when one considers only those children with some time lost, the burden was heaviest, in terms of average hours, on females, Hispanics, children from lower- to middle-income families, and those without insurance—perhaps those whose treatment needs have accumulated. This speculation is supported by epidemiological data, which indicate that treatment need is greatest among minority and lower socioeconomic children, particularly teenagers. 12,13 Again, those who are most economically disadvantaged may bear a greater burden of social impact.

These analyses have produced exploratory evidence of the impact on society of oral problems or dental visits in selected socioeconomic groups at the aggregate national level. The results provide the basis for

TABLE 4—Annual Number of Days with Restricted Normal Activities Because of Dental Visit/Problem, in the Total US Population

		Restricted Days				
	Total Days, in Thousands	Mean	One SE	Unweighted Sample		
Total US population	41 406.0	.17	.021	113 276		
Sex						
Male	12 877.4	.11	.018	53 844		
Female	28 528.6	.23	.03	59 432		
Age, y						
< 5	766.6	.04	.034	9 121		
5–7	322.9	.03	.030	5 3 1 7		
8-12	937.4	.05	.017	8 707		
13_17	1 838.9	.11	.026	8 300		
18-24	4 599.9	.18	.044	10 987		
25_44	17 683.1	.23	.036	35 491		
45–64	8 678.0	.19	.038	21 534		
≥ 65	6 578.8	.23	.122	13 819		
Race						
White	35 456.7	.18	.024	93 002		
Black	5 303.8	.18	.039	16 703		
Other	645.5	.08	.043	3 571		
Ethnicity						
Non-Hispanic	38 747.8	.18	.02	103 124		
Hispanic	2 658.2	.12	.054	10 152		
Education of responsible adult, y						
< 12	9 608.2	.28	.109	16 937		
12	15 156.3	.18	.027	41 297		
> 12	16 641.5	.14	.019	55 042		
Family income*						
< \$10 000	14 796.9	.24	.064	29 957		
\$10-19 999	10 477.6	.25	.053	19 604		
\$20_34 999	8 446.3	.15	.023	26 569		
≥ \$35 000	7 685.1	.10	.019	37 146		
Dental insurance						
coverage						
Yes	14 145.0	.13	.020	51 995		
No	27 261.0	.22	.035	61 281		

\*May not acid to total due to nonresponse on independent variable, rounding, and/or weighting for complex survey design in SUDAAN.

additional multivariate analyses of the joint and relative effects of sociodemographic variables on the social impact measures being addressed in a future publication. Additional comparisons of these data with the responses to questions on the NHIS core questionnaire regarding short-term disability associated with acute dental conditions will provide valuable information on estimation bias introduced through questionnaire wording.

Additional methodological issues raised by these analyses suggest the need to study the social impact of oral diseases within a different research design. The 2-week recall approach used in NHIS has advantages for reducing some types of

bias. Evidence shows, however, that this strategy results in underestimations, limits the ability to classify individuals or describe behaviors over the period of a year, and, on a low-incidence event, produces a very small yield of relevant cases and thereby restricts the ability to compare differences among socioeconomic groups effectively.10 These problems are particularly obvious in the case of multiple visits for complex restorative treatment over a period of weeks or months. Increased understanding of social impact may well require a panel study or some other research strategy, such as in-depth examination of school, work, practice, or insurance records. Alternatively, improved understanding of social impact might best be achieved by targeted research in selected socioeconomic groups.

A biobehavioral model might be useful for addressing the questions raised by these analyses because of the characteristics of dental problems and their sensitivity to social processes. For example, why does it appear that those who can least afford it lose the greatest amount of time because of oral problems or dental visits? How does time lost for oral problems compare with that lost for medical problems for the same social groups? What are the reasons for time lost? Are there segments of society that have more problems with health and, consequently, more problems with social functioning? Would measures of the seriousness of both oral health problems and delayed treatment increase understanding? The integration of medical and oral clinical measures with psychosocial, demographic, socioeconomic, and social impact measures would shed light on the mechanisms underlying differences in oral health found in population surveys.

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# APPENDIX—Definitions of Social Impact Measures, US National Health Interview Survey—Dental Supplement

Time missed from work/school: Hours missed in past 2 weeks because of dental problem or dental visit in past 2 weeks (bases = employed in past 2 weeks or of school age)

Time missed to assist: Hours missed in past 2 weeks from work or school to assist a relative or friend with dental problem or dental visit (bases = employed in past 2 weeks or school age)

Total time missed: Hours missed in past 2 weeks, as described above, for own dental problem/visit and/or that of a relative or friend

Restricted normal activity: Number of days in past 2 weeks when normal activities were reduced by more than one-half day because of dental problem or visit, not counted as part of school or work lost (base = all household members)